



INDIAN STATISTICAL INSTITUTE

Theoretical Statistics and Mathematics Unit, Kolkata

SEMINAR

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VENUE:

L-infinity

(5th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

TITLE:

Keep or toss? A nonparametric score to evaluate solutions for noisy ICA

SPEAKER:

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ABSTRACT:

Independent Component Analysis (ICA) was introduced in the 1980's as a model for Blind Source Separation (BSS) by Comon et al, which refers to the process of recovering the sources underlying a mixture of signals, with little knowledge about the source signals or the mixing process. It has become a powerful alternative to the Gaussian model leading to PCA in factor analysis. The key idea in ICA is the development of a contrast function which is minimized for Gaussian random vectors and leads to an objective function that is maximized when one learns the directions of the independent components. The major algorithms FastICA (Hyvarinen, 1999) and JADE (Cardoso, 1993) do this using functions based on kurtosis. These algorithms can give severely biased results if the independent component distributions are heavy-tailed or have no higher moments (Anderson et al., 2017; Chen and Bickel, 2005; Hyvarinen, 1997) or the kurtosis of the components is small in magnitude. We consider the noisy ICA, where one has a linear combination of independent non-Gaussian random variables perturbed by independent additive Gaussian noise. While there are many works with different contrast functions and different sophisticated algorithms for estimation, we develop a diagnostic to adaptively pick the right algorithm to uncover the directions from a set of available algorithms. In addition, we propose some new contrast functions and algorithms that enjoy the same fast computability as existing algorithms like FASTICA and JADE but work in domains where the former may fail. While these also may have weaknesses, our proposed diagnostic, as shown by our simulations, can remedy them. This is joint work with Syamantak Kumar and Peter Bickel.

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